

**WHAT IS CLAIMED IS:**

1. A method for forming a nitride semiconductor device, comprising:
  - (a) growing one or more gallium nitride (GaN) layers on a substrate; and
  - (b) growing one or more non-polar (Al,B,In,Ga)N layers on the GaN layers to form at least one quantum well ranging in width from approximately 20 Å to approximately 70 Å.
- 5 2. The method of claim 1, wherein a maximum emission intensity is associated with a quantum well width of approximately 50 Å.
- 10 3. The method of claim 1, wherein the quantum well has an optimal width of 52 Å.
- 15 4. The method of claim 1, wherein a resistive nature of the GaN layers prevents band edge emission at room temperature, resulting in emissions only from the quantum well.
5. The method of claim 1, wherein the GaN layers are non-polar a-plane GaN layers and the substrate is an r-plane substrate.
- 20 6. The method of claim 1, wherein the substrate is a sapphire substrate.
7. The method of claim 1, wherein the growing step (a) comprises:
  - (1) annealing the substrate;
  - (2) depositing a nitride-based nucleation layer on the substrate;
  - (3) growing the GaN layer on the nucleation layer; and
  - (4) cooling the GaN under a nitrogen overpressure.
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8. The method of claim 1, wherein the growing steps are performed by a method selected from a group comprising metalorganic chemical vapor deposition (MOCVD), molecular beam epitaxy (MBE), liquid phase epitaxy (LPE), hydride vapor phase epitaxy (HVPE), sublimation, and plasma-enhanced chemical vapor deposition (PECVD).

9. A device manufactured using the method of claim 1.

10 10. A nitride semiconductor device, wherein the nitride semiconductor device is created using a process comprising:

- (a) growing one or more gallium nitride (GaN) layers on a substrate; and
- (b) growing one or more non-polar (Al<sub>x</sub>B<sub>y</sub>In<sub>z</sub>Ga)<sub>n</sub> layers on the GaN layers to form at least one quantum well ranging in width from approximately 20 Å to

15 approximately 70 Å.

11. A nitride semiconductor device, comprising:

- (a) one or more gallium nitride (GaN) layers grown on a substrate; and
- (b) one or more quantum wells formed from one or more non-polar (Al<sub>x</sub>B<sub>y</sub>In<sub>z</sub>Ga)<sub>n</sub> layers grown on the GaN layers, wherein the quantum well has a width ranging from approximately 20 Å to approximately 70 Å.